Improving IOP measurement uncertainties for PACE ocean color remote sensing applications

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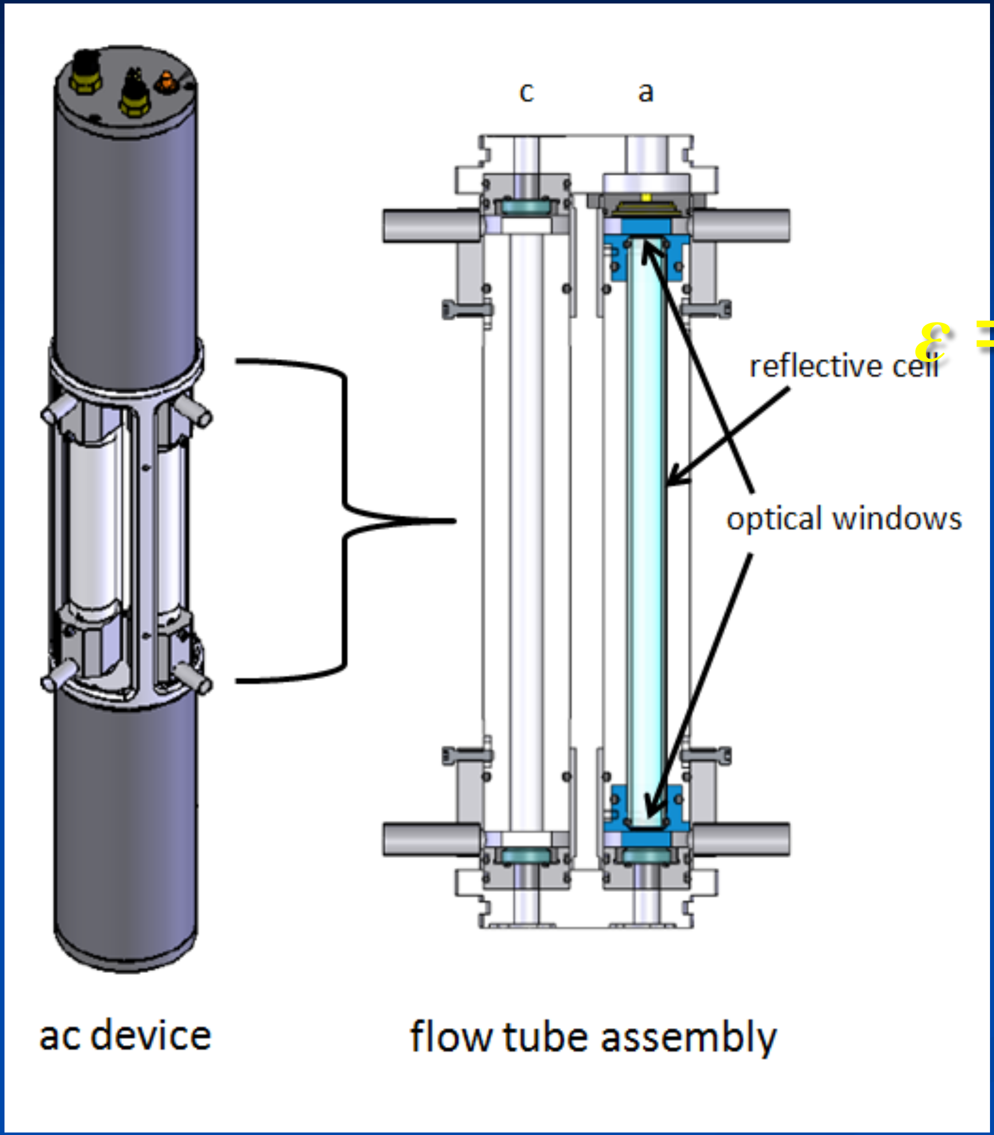
IOPs: absorption (a) and VSF (β) for cal-val

1. Quantify and improve uncertainties (scattering error) in absorption measurements using ac devices.



TIR = 41.7°

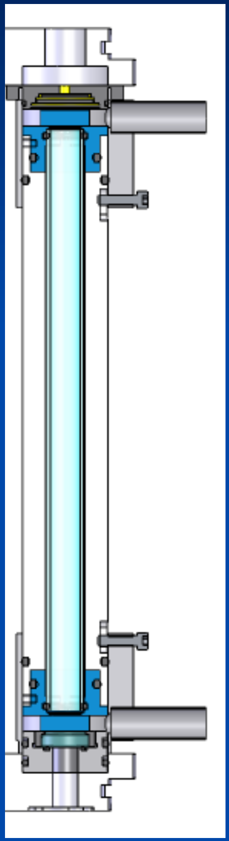
$$\varepsilon = \int_{\theta_{TIR}\ (41.7^\circ)}^{\pi\ (180^\circ)} 2\pi \sin(\theta)\beta(\theta)d$$

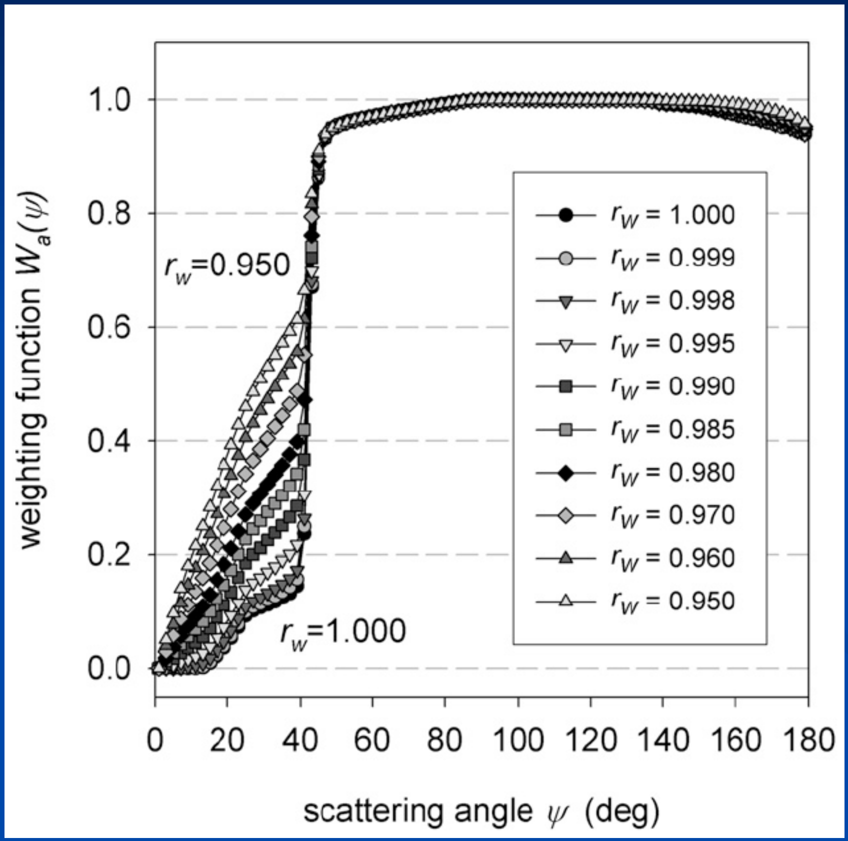
Currently ~ 5 to 6 correction methods in use

Most assume little to no a_g & a_p at a reference λ

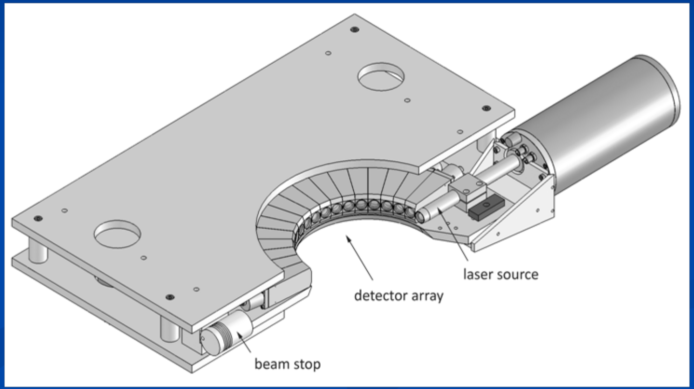
No community consensus

1. Quantify and improve uncertainties (scattering error) in absorption measurements using ac devices.





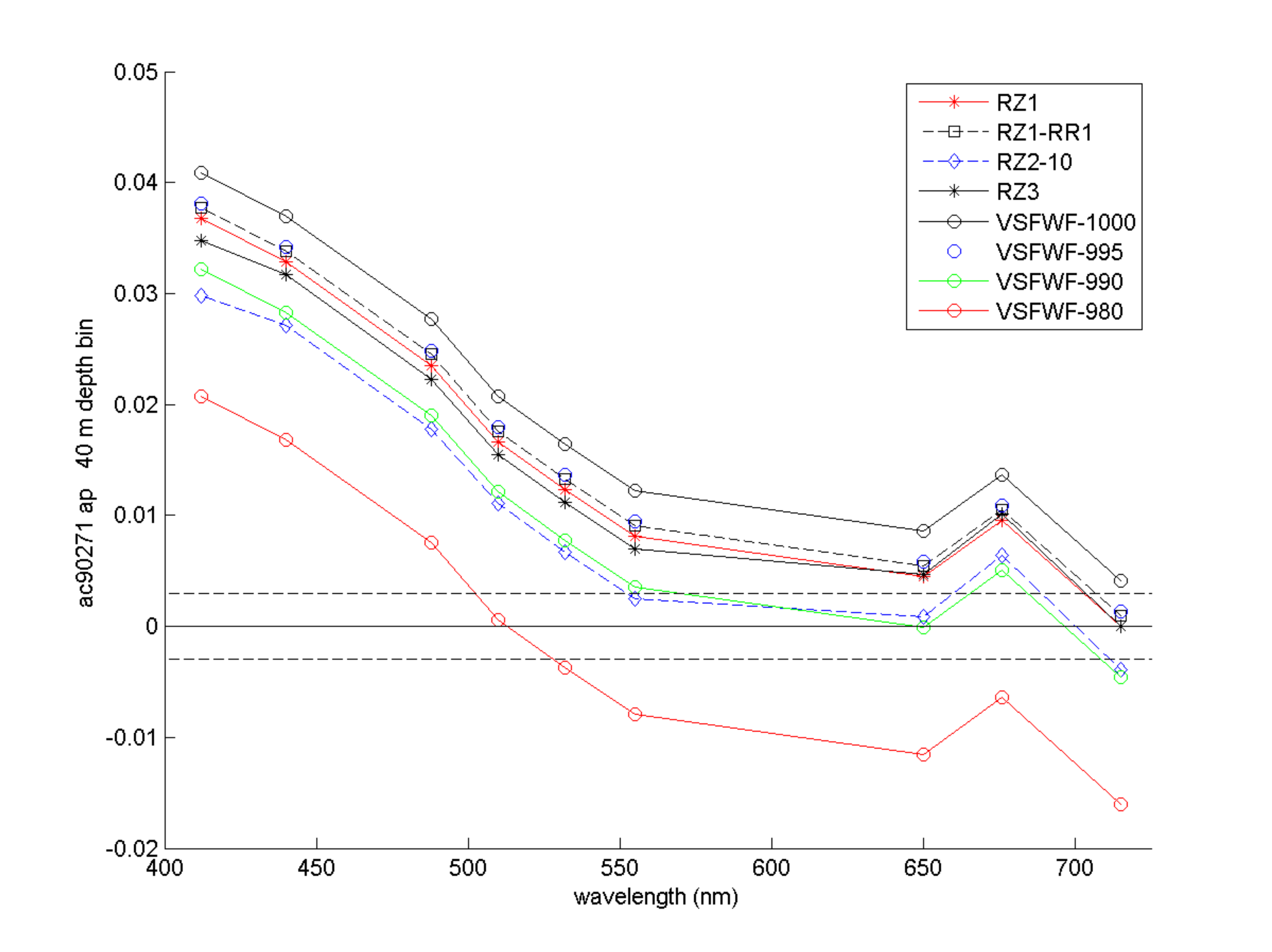
Independent correction with VSF measurements



All current correction methods will be compared , uncertainties estimated, with independent validation of best correction.

Reflectivity of new and aged flow cells will be quantified in lab.

Results!

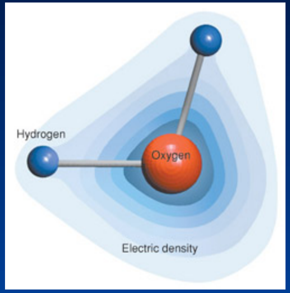


NASA SABOR cruise (13 yr. old ac9)

2. Determine uncertainties associated with different values of the depolarization ratio for pure seawater backscattering (b_{bsw}).

$b_{bsw}(\lambda)$ = F(T, S, pressure, δ)

b_{bsw} is ~ 80 - 95% of the water leaving signal in large swaths of the oceans



Pure seawater backscattering values (b_{bsw}) as currently parameterized in SeaDAS compared to b_{bsw} values of Zhang et al. (2009) calculated at two different depolarization ratio (δ) values: 0.039 and 0.09 (Farinato & Rowell 1976, Morel 1974 respectively) and at 20°C and 38 PSU.

$b_{bsw}(\lambda)$	412	443	488	547	667
SeaDAS no T/S	0.003327	0.002438	0.001611	0.000989	0.000425
Zhang (δ = 0.09) ~ 3 - 4% lower	0.003192	0.002340	0.001552	0.000960	0.000420
Zhang (δ = 0.039) ~ 10 - 12% lower	0.002920	0.002140	0.001420	0.000878	0.000384

We will conduct an uncertainty analysis on retrieval products similar to Werdell et al. 2013 (T/S dependence) using different δ values (and appropriate T/S) for several SAA algorithms (QAA, GSM, GIOP)

Group Synergies:

Environmental methodologies – best practices for community

Improving uncertainties in ac validation data sets
(SeaBASS, TARA, etc.)

Validation of ac corrections with independent measurements
Dariusz, Collin, Rudy & David (joint cruise planned)…

Depolarization ratio work with Xiaodong

Understand uncertainties in retrievals related to uncertainties in pure water backscattering